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PROPELLER-BLOWER APPLICATOR FOR FUMIGATION WITH HYDROCYANIC ACID ¹/₁

By Harold R. Yust
Division of Fruit Insect Investigations

A multivane blower applicator for applying hydrocyanic acid beneath tent-covered trees (Fulton et al. ¹/₁) was described by Fulton and Nelson (2) in 1946. Further experience showed the need for a machine that would give better immediate distribution of the gas. Therefore, an applicator with a propeller fan that gives good gas distribution without post-release circulation was developed and built. A number of other improvements were incorporated in the new unit. This applicator was tested for hydrocyanic acid fumigation of citrus and is now being used in the Hall scale fumigation at Chico, Calif.

Two views of the applicator are shown in figures 1 and 2. The essential parts are a propeller fan, a gasoline engine, and a liquid hydrocyanic acid tank mounted on a wheelbarrow. A standard vaporizer wheelbarrow frame was used with a 3.85- by 20-inch pneumatic tire. The overall length of the unit is 8 feet.

The fan is powered by a 4-cycle, 1-cylinder gasoline engine that generates 1.5 hp. at 2600 r.p.m. The engine is air-cooled and weighs 38 pounds. It is located directly behind the wheel on an adjustable mounting. A flexible metal hose connects the engine with a muffler 3 inches in diameter by 22 inches long. The muffler is next to the wheel and the exhaust is directed toward the fan. The metal hose is insulated with plastic asbestos and wrapped with glass cloth. The engine is enclosed on three sides and there is a hood on hinges over the top. A 4-inch-high guard on the hood prevents the tent from slipping down on the engine. A strip of duck cloth the width of the engine housing and 8 inches long extends to the ground behind the wheel.

The propeller fan is in front of the wheel, is 16 inches in diameter, and has a depth of $4 \frac{5}{32}$ inches. It has 4 blades and is the pressure type. The blades, hub, and spider are made of steel. The blades have a 27-degree pitch and the fan is directed upward about 5 degrees. The fan housing is 17 inches in diameter and 8 inches long. It has a ground clearance of 15 inches when standing on the level and a clearance of about 9 inches when pushed on the level. The fan is mounted on a shaft $15/16$ inch in diameter, which extends along the right side of the

¹/₁ The American Cyanamid Company, Azusa, Calif., cooperated in constructing the applicator.

wheel to a point above the engine. The shaft is between the muffler and the wheel and has two self-aligning ball bearings. The shaft pulley is 3 3/4 inches in diameter and the drive pulley is 3 1/2 inches. The unit operates with a 34-inch V-belt. The pulleys and belt are enclosed by the engine housing. In operation the fan rotates counter clockwise at approximately 1725 r.p.m. At this speed with a static pressure of 0.1 inch of water the fan delivers 2575 c.f.m.

A standard hydrocyanic acid pump and a tank with 45 pounds' capacity are mounted next to the engine. The tank is connected by a 1/4-inch copper tube to a 2-outlet nozzle located in front of the fan. The tube is insulated with electric loom. The nozzle is centered near the leading edge of the fan housing. The holes in the nozzle are 5/64 inch in diameter. The nozzle has a check valve to prevent leakage of the hydrocyanic acid in the tube.

In operation the propeller-blower applicator is pushed under a tree through a "dog hole" in the tent with the fan directed toward the tree center. The tent skirt is draped over the engine housing. The required dosage is pumped into the air stream of the fan. The fan creates a turbulence of the air under the tree and distributes the hydrocyanic acid as it is released. The metal panel, between the engine and the wheel, and the strip of canvas cloth extending to the ground prevents the hydrocyanic acid vapor from escaping toward the operator while he is pumping the hydrocyanic acid under the tent-covered tree. As the unit is pulled out the fan blows the opening down. In the citrus fumigation tests the front opening of the fan was covered with hardware cloth, 1/2-inch mesh, to protect the fan from the tree limbs and foliage. Guards along the wheel, shaft, and fan keep the tent from becoming entangled in the moving parts. The muffler reduces the engine noise so the necessary conversation of the fumigation crew may be heard. The exhaust line is insulated and shielded to prevent burning the tent.

Literature Cited

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Figure 1.--Side view of propeller-blower applicator, showing location of essential parts.



Figure 2.--Front view of propeller-blower applicator, showing fan and nozzle.

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